WHAT IS CLAIMED IS:

1. A method of manufacturing a capacitor having a tantalum oxide film as an insulating film, said method comprising:

vapor-phase depositing a tantalum oxide film on a lower electrically conductive film;

treating the tantalum oxide film with active oxygen species;

annealing the tantalum oxide film treated with the active oxygen species, at a temperature lower than a crystallization temperature of tantalum oxide by 10℃ to 80℃ in an inert atmosphere; and

forming an upper electrically conductive film on the annealed tantalum oxide film.

2. The method according to claim 1, wherein the said annealing is conducted at a temperature of about 620℃ to about 690℃.

3. The method according to claim 1, wherein said lower electrically conductive film is formed of a metal-based electrically conductive material.

4. The method according to claim 3, wherein said metal-based material is selected from ruthenium, tungsten, aluminium, platinum, tungsten nitride, titanium nitride, and titanium silicon nitride.

5. A method of manufacturing a capacitor having a tantalum oxide film as insulating film, said method comprising:

vapor-phase depositing a tantalum oxide film on a lower electrically conductive film;

annealing the tantalum oxide film at a temperature lower than a crystallization temperature of tantalum oxide by 10℃ to 80℃ in an inert atmosphere;

treating the annealed tantalum oxide film with active oxygen species; and

forming an upper electrically conductive film on the tantalum oxide film treated with the active oxygen species.

6. The method according to claim 5, wherein said annealing is conducted at a temperature of about 620℃ to about 690℃.

7. The method according to claim 5, wherein said lower electrically conductive film is formed of a metal-based electrically conductive material.

8. The method according to claim 7, wherein said metal-based material is selected from ruthenium, tungsten, aluminium, platinum, tungsten nitride, titanium nitride, and titanium silicon nitride.

9. A method of manufacturing a capacitor having a tantalum oxide film as insulating film, said method comprising:

a first vapor-phase deposition step of vapor-phase depositing a first tantalum oxide film on a lower electrically conductive film;

a first annealing step of annealing the first

tantalum oxide film at a temperature lower than the crystallization temperature of tantalum oxide by 10℃ to 80℃ in an inert atmosphere;

a first treatment step of treating the annealed first tantalum oxide film with active oxygen species;

a second vapor-phase deposition step of vapor-phase depositing a second tantalum oxide film on the first tantalum oxide film treated with active oxygen species;

a second treatment step of treating the second tantalum oxide film with active oxygen species;

a second annealing step of annealing the second tantalum oxide film treated with the active oxygen species, within a temperature range between a temperature lower than the crystallization temperature of tantalum oxide by 10℃ to 80℃ and a temperature at which the tantalum oxide crystallizes, in an inert atmosphere; and

a step of forming an upper electrically conductive film on the annealed second tantalum oxide film;

wherein the step of forming the second tantalum oxide film, the subsequent second treatment with active species and the second annealing step are conducted sequentially at least once, before the formation of the upper conductive film.

10. The method according to claim 9, wherein said first annealing step is conducted at a temperature of

about 620℃ to about 690℃.

11. The method according to claim 9, wherein said second annealing step is conducted at a temperature of about 650℃ to about 750℃.

12. The method according to claim 9, wherein said lower electrically conductive film is formed of a metal-based electrically conductive material.

13. The method according to claim 12, wherein said metal-based material is selected from ruthenium, tungsten, aluminium, platinum, tungsten nitride, titanium nitride, and titanium silicon nitride.

14. The method according to claim 9, wherein said step of forming the second tantalum oxide film, said second treatment with active species and said second annealing step are conducted sequentially twice or more.